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Goddard Space Flight Center
Greenbelt, Maryland

From: Colorado School of Mines
Department of Geology

Subject: Type I report for the period 1 August to 31 September 1973 (NASA Contract NAS5-21778)

Title: Geologic and Mineral and Water Resources Investigations in Western Colorado (Proposal 026)

(GSFC Principal Investigator Identification No. UN 209)

INTRODUCTION

The primary objective of the Colorado School of Mines ERTS-1 Program is to analyze ERTS-1 data for identification and discrimination of geological and hydrological phenomena in central and western Colorado. To facilitate the achievement of this objective, the research has been subdivided into the following tasks:

Task I. Analyze ERTS-1 data for identification and discrimination of:

- A. lithology and surface composition
- B. geologic structure
- C. geomorphic phenomena
- D. mineral resources
- E. water resources
- F. volcanic phenomena

Task II. Determine the atmospheric affects on remote sensor data.

Task III. Investigate and evaluate:

- A. the RBV and MSS data for task I, A through F
- B. processing and enhancement techniques as applied to ERTS-1 data

Task IV. Educate graduate students and give experience to research personnel in the use of satellite remote sensor data.

Task V. Submission of a final report (Type III) which will discuss in depth the history of the overall project and all significant scientific and technical theories, procedures, techniques, equipment, tests and project results.

CURRENT INVESTIGATION

The principal activities during the past two months have been detailed and reconnaissance field studies of the Leadville mining district in central Colorado and selected mineralized areas in the San Juan volcanic field in the southwestern part of the state. Field work was based on the preliminary geologic interpretations of ERTS-1 imagery and aircraft support data. These studies have provided the ground truth information needed for the evaluation of the applications of ERTS-1 imagery to the study of mineral deposits in different geologic environments. The field studies were completed by the end of August.

Research during September included analysis and evaluation of field data and the comparison and correlation of field data with geologic interpretations of ERTS-1 imagery. Other activities included the plotting and statistical analysis of linear features on ERTS-1 scenes of central Colorado. Eight statistically significant linear trends were discovered. The mapped linears lie within a 60 degree band centered on due north. Since the sun azimuth, N. 27 W., lies within that band, it is concluded that the linears are caused primarily by long straight strips of darker tones reflecting differences in vegetation, soil saturation, etc. rather than long straight very high-angle slopes (ie.- topographically-expressed structures). The correlation of the linear trends to known regional joint sets is unsatisfactory.

Additional studies have been made on the structural geology of northwestern Colorado using black and white positive transparencies of ERTS-1 images. Attempts have been made to use color additive viewing techniques to enhance folds, but these studies have not been completed.

PROJECT STATUS

Progress of ERTS-1 satellite and support data analysis, interpretation and evaluation is proceeding along a productive course and should be completed on schedule. Current funding appears to be adequate for meeting the stated objectives of the CSM/ERTS-1 project.

NEXT REPORTING PERIOD

During the next reporting period ERTS-1 satellite and support data will be further analyzed, interpreted and evaluated. Field data collected during the summer will continue to be analyzed and compared with geologic interpretations of ERTS-1 imagery. ERTS-1 lineaments in central Colorado will be further studied. ERTS-1 imagery will be examined for known structural features and the remaining unknown linears will be interpreted stereoscopically. Additional field data will be gathered on the regional fracture systems for use in correlation with linears mapped on the imagery.

Methods of interpretation and enhancement of ERTS-1 satellite data will be investigated for delineation of potential target areas for mineral exploration. Potential target areas interpreted from ERTS-1 imagery will be compared and correlated with known mineralized areas. The criteria used in selecting target areas will be evaluated and specific mineralized areas in the Colorado mineral belt will be studied to determine how they are expressed on the ERTS-1 imagery.

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